InstantTune
Automatic Radio Tuning Software

User□s Guide
Version 1.10 © 1994-2002 Anthony Monteiro, AA2TX, aa2tx@amsat.org

InstantTune works with AMSAT□s InstantTrack software to provide □transparent□ Doppler Shift Tuning1 for satellite operation. This means you just tune your receiver to the desired station or frequency and the InstantTune software does the rest, no need to manually correct for Doppler shift or to tune your transmitter.

HOW IT WORKS

With InstantTune, you use your receiver's VFO knob to tune in a desired station or frequency. InstantTune detects when you are tuning and waits for you to finish. When you stop tuning, it remembers that frequency.

Based on your receiver's frequency, the current satellite velocity, and a satellite configuration file, InstantTune calculates the proper up link frequency and tunes your transmitter to that frequency.

About once per second, InstantTune re-calculates the up link and down link Doppler shifts and fine-tunes both your receiver and transmitter to compensate, maintaining a constant transponder frequency pair at the satellite. This method is superior to manual techniques that tune only the transmitter or receiver. With InstantTune you can be sure you are on frequency and not drifting through the satellite pass band.

FEATURES

Sets Transmitter Frequency and Mode

InstantTune sets your transmitter frequency to track your receiver frequency and sets the proper transmitter modulation mode to track the mode you select on your receiver including opposite side-band selection on inverting transponders.

Doppler Shift Tuning

Once a second, InstantTune fine-tunes both your receiver and transmitter to compensate for Doppler shift.

Sets Main Receiver to Satellite Beacon and Mode

When you select a new satellite to track, InstantTune sets your receiver to the proper frequency and modulation mode to monitor the beacon while you wait for the satellite to come into range.

Auxiliary Receiver

InstantTune lets you use a second receiver with automatic tuning and Doppler correction to monitor a second down link from the satellite. This lets you easily monitor both down links on dual transponder satellite or monitor an engineering beacon while using your main receiver to make contacts.

Frequency Converters and Transverters

InstantTune supports transmit and receive frequency converters. Both up and down converters may be used.

Easy to Use with InstantTrack

InstantTune is a DOS TSR program and is a companion to AMSAT□s popular InstantTrack software. Radio tuning is automatically controlled from the InstantTrack graphics or text satellite-tracking screen. When you select rotor tracking, InstantTune intercepts the messages so it knows which satellite to use with no special pop-up screens. You can use it with or without an antenna rotor. You can even check its status from the InstantTrack TSR status screen.

InstantTune supports background operation allowing you to exit from InstantTrack and run other DOS programs while continuing to track and tune the satellite.

Easy to Setup and Maintain

InstantTune comes pre-configured for use with the Yaesu FT-847 and current amateur satellites. The configuration file is plain ASCII text making it easy to add satellites as they are launched or to change or add new radios. There is no limit to the number of satellites or transponders and you can configure multiple transponders for each satellite.

No Special PC Hardware

InstantTune uses ordinary PC serial and parallel ports. No special cards or hardware is required making it ideal for use with laptop and notebook computers. InstantTune does not use a floating-point processor either so it will run on older PC□s.

Works with Popular Radios

InstantTune supports the Yaesu FT-847, FT-100, FT-817 and FT-736, the Kenwood TS-20000, TS-790, and HF radios, the ICOM IC-910, IC-821, IC-820, IC-970, and most other CI-IV and CI-V radios except for the IC-735. It will also work with any radio with UP/DOWN mic-buttons.

InstantTune allows you to mix and match radios at the same time. For example, you can use a Kenwood TS-450 as a receiver with a Yaesu FT-736 as a transmitter for mode-A satellites.

INSTALLATION

What You Need

· PC/AT class machine with minimum x386 CPU, 1 Meg RAM, DOS 5.0. InstantTune will also run in a FULL-SCREEN, DOS window under Windows 3.1 or later.
· AMSAT□s InstantTrack software package
· InstantTune installation file □itune110.zip□.

Step 1

Copy the file "itune110.zip" to your InstantTrack directory. This will usually be c:\it. If you are upgrading from a previous version, you may want to save your old configuration file by renaming it □itune.bak□ before unpacking the new version. Run pkunzip on this file to unpack it. This will add the following files to your InstantTrack directory:

itunetsr.exe

Step 2

InstantTune is pre-configured to use the Yaesu FT-847 on COM 1 for all satellites. If you want to use a different radio or different COM port, you will need to edit the □itune.cfg□ file. This is an ASCII text file so you can use any text editor to change it. There are several single radio configurations listed in the "itune.cfg" file. For the listed radios, add a semicolon in front of the FT-847 then find your radio in the list and remove the semicolon in front of it.

For other simple changes, such as a different COM port or to use a non-default bit rate, follow the directions in the comments in the □itune.cfg□ file. To setup a more complex configuration, review the commands in the detailed technical reference part of this manual.

The "itune.cfg" file includes all known, amateur-radio, satellites at the time the software was released. As new satellites are launched, you will need to append the new satellite transponder information to this file in order to use the new satellites.

Step 3

The order of setting environment variables and loading the TSR programs is critical for proper operation. The environment variables must be set first, then the rotor driver must be loaded, then the OrbitDRV TSR (part of the InstantTrack software,) and finally the InstantTune radio driver TSR. After these are loaded, you may start InstantTrack. Note that the radio driver TSR will refuse to load if it can not find OrbitDRV.

The included batch file □itstart.bat□ will do all of this for you, just type □itstart□ at the DOS prompt. The □ itstart.bat□ file is set up to run the co-processor version of the InstantTrack program. If you need to run the no co-processor version, edit the □itstart.bat□ file and read the comments in the file for directions.

Similarly, the □itstart.bat□ file is set up to use the dummy rotor driver, □dummykct.com,□ included with InstantTrack. If you use a real rotor driver, just replace □dummykct.com□ with the name of the real driver in the □itstart.bat□ file. Congratulations, you have completed installation of InstantTune!

Running under Windows

InstantTrack and InstantTune can be run as a DOS session under Windows. It must be run in a FULL-SCREEN or it will not work correctly. If you minimize the DOS session, InstantTune operation will be suspended because Windows will stop sending DOS timer ticks and interrupts to the TSRs. When you switch back to a full screen, satellite tracking and tuning will resume, however the real-time clock in the OrbitDRV TSR will no longer have the correct time!

To run under Windows, complete the installation for DOS as described above. To run, you can just open a full-screen DOS window and type □itstart.□

If you want to be fancy, the included □it.pif□ file can be added to your menu bar and you can change the icon using the included file □it.ico□ which has an icon resembling a micro-sat. See your Windows manual if you need help doing this.

OPERATION

InstantTune was specifically designed to work with InstantTrack. In most cases, you do not have to do anything special to activate radio tuning on a satellite.

To use InstantTune, type "itstart" at the DOS command prompt or double-click on the satellite icon. This will load all the required drivers and start InstantTrack.

Select a Satellite

Choose an InstantTrack text or graphics real-time tracking screen and select a satellite to track.

Start and Stop Radio Tuning
Type the "r" command from a real-time tracking screen. InstantTrack will start rotor tracking and InstantTune will start radio tuning on the selected satellite. To stop rotor tracking and radio tuning, type the "r" command again.
Operating with InstantTune
When you start tuning with the □r□ command, you should see your receiver VFO change to the satellite beacon or digital down link frequency. Then, about a second later, it will retune to correct for the Doppler shift. The receiver should continue to track the beacon or down link frequency unless you manually tune it to another frequency. If you have a transmitter configured, the transmitter VFO will also change to the corresponding up link frequency.

InstantTune detects when you re-tune your receiver. Once you have stopped tuning, InstantTune will maintain the proper frequency for you by fine tuning the receiver to compensate for Doppler shift.

For satellites with analog transponders, InstantTune will tune your transmitter to track your receive frequency and will also adjust the transmit frequency to compensate for up link Doppler shift. InstantTune will maintain a constant transponder input-output frequency pair at the satellite. If you change the modulation mode on your receiver, InstantTune will automatically set the proper transmitter mode including selecting the opposite sideband on inverting transponders.

For fixed frequency transponders (i.e. AO-27) or digital satellites, InstantTune tunes your transmitter to the up link frequency and sets the proper modulation mode for the satellite. InstantTune will fine-tune the transmitter frequency to compensate for the Doppler shift. Although this is not always required, it can help improve the effectiveness of your up link signal. Tuning your receiver or changing the receive modulation mode will not change the transmitter frequency or mode on these satellites.

Due to errors in the published transponder parameters, satellite Keplerian elements, or the frequency accuracy of your radios, you may need to adjust the transmitter or receiver VFOs to bring your transmit and receive signals together. For the FT-847, you use the sub-band tuning knob to adjust the transmit frequency. You cannot use the □clarifier□ function. For the TS-790, you need to manually select the MAIN band, set the VFO to fine tune the transmitter, then switch back to the SUB band. For most other radios, you can use either the receiver independent tuning (RIT) or transmitter independent tuning (XIT) functions.

If you find the signals consistently off-frequency or beyond the range of your RIT/XIT controls for a given satellite, you will want to change the transponder translation constant in the □itune.cfg□ file for that satellite. Specific instructions are in the technical reference section.
Checking Tuning Status
Selecting "TSR Status," item 9, on the InstantTrack, main menu shows the status of the RotorDRV and OrbitDRV TSR's. InstantTune controls the tuning status of OrbitDRV so it will reflect the current state of radio tuning.
Selecting a Specific Transponder Mode
By default, InstantTune selects the first transponder listed for a satellite in the "itune.cfg" file. Since most satellites only have one mode, this is usually sufficient. Some satellites, like AO-40, support many different transponder modes. You can tell InstantTune to use a specific transponder mode instead of the default. When you select a specific transponder mode, InstantTune saves your selection in a file named □itune.sel.□ Once you select a specific transponder, it remains selected until you change it, even after you power off your computer. You can reset all transponders of all satellites back to the default by deleting the □itune.sel□ file.

Here are the instructions for selecting a specific transponder mode instead of the default:

Step 1
Quit from InstantTrack putting you back to the DOS prompt.

Step 2
At the DOS prompt type:

itune mode SATELLITE MODE <ENTER>

where SATELLITE is the name of the satellite and MODE is the desired transponder mode. For example, to set RS-12/13 to use RS-12 mode A, type:

itune mode RS-12/13 12A <ENTER>

To specifically select the default mode, use the same command without specifying a transponder mode. For example to select the default mode for RS-12/13, type:

itune mode RS-12/13 <ENTER>

You can set the mode in this way at any time. You do not have to have InstantTrack running or even have the radio driver TSR loaded.

Step 3
Type "it" at the DOS prompt to re-start InstantTrack, do not type "itstart" as this will load a second copy of the OrbitDRV TSR and things will no longer work. When you start rotor tracking again on the selected satellite, it will use the transponder mode you selected instead of the default. Note that this will not affect any radio tuning that may be already in progress.

Background Tracking and Tuning
Once you have started rotor tracking and radio tuning, they can be run in the background. You can quit from InstantTrack with tracking and tuning running and run other DOS programs in the same DOS session such as terminal emulators, digital satellite software, or telemetry decoding programs. Note that you CANNOT run Windows programs and have tracking and tuning continue in the background. Tracking and tuning will cease if you change the DOS prompt Window from a full-screen.
OPERATIONAL NOTES FOR RADIOS
All UK Radios
If using certain European (especially UK) versions of radios, be aware that you cannot start-up with the receiver or transmitter out-of-band. This is an issue on FO-20/29 satellites since when the receiver is set to the beacon, the transmitter frequency WILL be out-of-band above 146 MHz. You WILL need to change the beacon frequency in the "itune.cfg" file and pick a beacon frequency that keeps the transmitter in the pass-band rather than the actual satellite beacon.

YAESU FT-847
The FT-847 works "transparently" with automatic tuning. You just tune using the transceiver□s tuning knob and select whatever receiver modulation type you want. InstantTune does the rest. You may want to fine tune your transmit frequency initially to compensate for errors in the Keplerian elements. To do this, use the □sub-band□ tuning function not the □clarifier□ function.

Before starting up InstantTune, make sure that the built-in tracking function in the satellite mode is turned off and the receiver VFO is set to the main tuning knob.

The FT-847 does not support mode K satellite transponders.
YAESU FT-100 and FT-817
The FT-100 and FT-817 are not "satellite" radios and as such, there are certain limitations with the CAT interface. To get around these limitations, the software sets the radio to run in "split" frequency mode. It uses VFO-A for receiving and VFO-B for transmitting. The radio will automatically select VFO-B when the operator presses the PTT button. Due to a limitation of the CAT interface, the software cannot set the VFO-B (transmitter) frequency when transmitting so it sets it only when receiving. To do this, it temporarily selects VFO-B, sets the VFO frequency, and then re-selects VFO-A. Since the software can do this quite quickly, it would not be too bad except that the radio also blanks the audio for a brief moment. This is annoying but you get used to it. The software attempts to reduce this blanking as much as possible by only tuning the transmitter to the nearest 100Hz. On receive, the FT-100 does not blank the audio so the software maintains proper tuning to the nearest 10 Hz.

Note that the above CAT limitation means that the transmitter frequency tuning updates stop when the PTT button is depressed, so it is a good idea to keep transmissions short!

Another side effect of the CAT problem is that if the operator hits the PTT button just as the software had just started a transmit frequency update, then you might end up transmitting on the downlink. Unfortunately, the software cannot do anything about this so the operator must give the front panel a quick glance to make sure this has not happened. If it does, the operator has to release the PTT button and the software will detect this condition and re-sync with the radio within 2 seconds after the PTT button is released. The operator can then try again. Fortunately, the window for this condition is quite short so it should not happen very often.

In spite of the CAT limitations, the resulting operation is actually quite usable and provides fully "transparent" operation. You just tune the receiver using the main tuning knob. The software sets the transmitter to the correct frequency for you. While operating, the software adjusts the Doppler-shift for you so you do not need

to constantly re-tune. If you want to change the mode, you just change it on the receiver from the front panel as you normally would and the software will change the transmitter for you. The FT-100 will operate on all satellite transponder modes including the ISS up to 436MHz including mode K.

YAESU FT-736

The CAT interface on the FT-736 is limited; you cannot use computer control and the front panel at the same time. Therefore, InstantTune supports the FT-736 receiver tuning by using your PC keyboard to control the receiver VFO. Keyboard control becomes active after you start tracking/tuning from InstantTrack. This works as follows:

· To enable the keyboard for tuning, turn on <CAPSLOCK>.
· To disable keyboard tuning, turn off <CAPSLOCK>.

Once you have turned on <CAPSLOCK>, the following keys are used to control the radio□s RECEIVE frequency:

<RIGHT ARROW>	UP VFO
<LEFT ARROW>	DOWN VFO
<UP ARROW>	UP RIT
<DOWN ARROW>	DOWN RIT

The frequency step size depends on the modulation mode and can be increased by holding down a modifier key. The tuning steps are as follows:

You can set the receive modulation mode by using the following keys:

<F>	FM
<C>	CW
<L>	LSB
<U>	USB

You may need to set the satellite mode VFOs to the proper bands before starting radio tuning or the FT-736 may refuse the CAT commands.

The FT-736 always uses the COM port at 4800 BPS regardless of COM port speed settings in the □ itune.cfg□ file.

KENWOOD TS-2000

The Kenwood TS-2000 provides fully "transparent" Doppler-shift tuning. You do not use the SUB BAND receiver for satellites on this radio. Instead, you tune the MAIN BAND for receiving and InstantTune will set the proper transmit frequency and mode.

KENWOOD TS-790

The Kenwood TS-790 provides fully "transparent" Doppler-shift tuning. You tune the SUB BAND receive VFO and can set whatever modulation type you want, InstantTune will set the transmit frequency and mode on the MAIN BAND VFO. You will want to turn down the audio level of the □beeper□ as InstantTune needs to swap between SUB and MAIN bands to maintain proper Doppler tuning and this causes an audible □ beep.□

Note that the Receiver Independent Tuning (RIT) does not work on the SUB band and the radio does not have an XIT so InstantTune has a special way to adjust the transmit offset. To set the transmitter offset, first set your SUB VFO to a clear spot on the downlink. Next, select the MAIN BAND, which will stop all Doppler tuning. Adjust the MAIN band VFO until you hear your own signal tuned in properly in the SUB receiver. Finally, re-select the SUB band to lock-in the new offset.

InstantTune tunes the receiver frequency in 20 Hz steps in SSB/CW and 100Hz steps in FM. By default, it tunes the transmitter frequency in 100Hz steps in all modes as a compromise between tuning accuracy and the annoying swapping between SUB and MAIN BANDS that is needed to maintain the Doppler-shift tuning. You can override the default and select the transmit tuning step size on SSB/CW to be 20, 40, 60, 80, or 100Hz through the configuration file and you can select a different tuning step size for each satellite if you so desire (see configuration section for details.) For fast moving LEOs, a larger step size is probably better whereas for elliptical orbit satellites, you may find a smaller step better.

If you want to use digital modes, you will need to disable the □audio mute□ function.

The TS-790 radios always use the COM port at 4800 BPS, regardless of COM port speed settings in the □ itune.cfg□ file.

KENWOOD HF Radios

The Kenwood HF radios provide fully "transparent" Doppler-shift tuning with InstantTune. You just tune the receive VFO using the transceiver tuning knob and select whatever receive modulation type you want. InstantTune does the rest. You may want to fine tune your transmit or receive frequency to compensate for errors in the Keplerian elements. To do this, you just use the RIT or XIT controls as you normally would.

InstantTune has a special tuning algorithm for Kenwood HF radios that dramatically reduces audio blanking. This allows you to use an unmodified radio to receive digital satellites. Of course, for HF radios you generally would also need to use a down converter.

On the HF radios, this algorithm is disabled if you try to use both the transmitter and receiver at the same time. However, you CAN use a single HF transceiver to operate mode K in split mode (i.e. half-duplex.)

On HF radios, FINE-TUNE is turned ON by InstantTune in FM or AM modes and turned OFF in SSB/CW/FSK modes. This is to maintain a 10 Hz tuning step. For proper operation, do not change this setting.

Kenwood radios always use the COM port at 4800 BPS, regardless of COM port speed settings in the □ itune.cfg□ file.

ICOM IC-910

The ICOM IC-910 provides fully "transparent" Doppler-shift tuning. You tune the receive VFO and can set the modulation type you want. InstantTune will set the transmit frequency and appropriate transmit mode.

ICOM IC-821, IC-820, IC-970

These previous generation satellite radios provide fully "transparent" Doppler-shift tuning. For these radios, you tune the SUB BAND receive VFO and can set the modulation type you want. InstantTune will set the transmit frequency and appropriate mode on the MAIN BAND.

ICOM CI-IV and CI-V Radios

A pair of these radios can be used in a fully "transparent" Doppler-shift tuning configuration. You use one radio for the downlink and another radio for the uplink. You tune the downlink radio (receiver) VFO and set the desired receive modulation type. InstantTune will set the uplink radio (transmitter) frequency and the appropriate modulation mode. You can use a □satellite□ radio as one of the radios. It will function in half-duplex mode.

Mic-Button Radios

Mic-Button radios do not have a CAT interface. However, InstantTune can work with these radios by activating the up/down mic-buttons using the PC parallel port. This interface is limited in functionality and user convenience. Mic-button radios can only be used as either a receiver or a transmitter; they cannot be used as both at the same time. When used as a transmitter, Mic-Button radios are a bit slow in tuning but otherwise work fine. For receiving, Mic-button radios can be tuned from the PC keyboard much like the FT-736. This works but is cumbersome!

Keyboard tuning control becomes active if you have configured the radio as a receiver and you start tracking/tuning from InstantTrack. This works as follows:

- To enable the keyboard for tuning, turn on <CAPSLOCK>.
- To disable keyboard tuning, turn off <CAPSLOCK>.

Once you have turned on <CAPSLOCK>, the following keys are used to control the radio□s RECEIVE VFO:

<RIGHT ARROW>	UP VFO
<LEFT ARROW>	DOWN VFO
<UP ARROW>	UP RIT
<DOWN ARROW>	DOWN RIT

The frequency step default is 100Hz. You can change the default step to anything your radio will support by setting the proper parameter in the □itune.cfg□ file. You can tune faster by holding down the shift keys while tuning with the arrow keys. The tuning steps are then multiplied as follows:

key

You can set the RECEIVE VFO modulation by using the following keys:

<A>	AM

<F> FM
<C> CW
<L> LSB
<U> USB

This will NOT change the receiver modulation mode of course, as the UP/DOWN buttons cannot do this. This function is used to tell InstantTune that you have changed it manually so that the software can properly set the transmitter mode.

To use a mic-button radio, you need to provide an electrical interface from the PC parallel port to your radio. The following leads are used on the parallel port:

FUNCTION
All signals are normally LOW (0 Volts) and pulse High (+5 Volts) when active. The PC parallel port signals will directly drive a 6N139 optical coupler when used with a 4.7K Ohm series resistor. The 6N139 outputs will drive most modern radios when tied in parallel with the mic-buttons. Observe the proper polarity. No external power supply is needed.

The "Tuning Complete" signal can be used to drive an LED for a positive visual indication that tuning is complete. When large frequency changes are made, tuning can take several seconds depending on the step size. You can watch your radio's frequency display to see when it stops changing, but the indication is a nice convenience. This signal is set HIGH to directly drive a low power LED when the radio tuning is finished; no external power supply is needed.

No IRQs are used with the parallel port. You may re-use the LPT IRQ for your serial ports if you need them. InstantTune supports LPT1, LPT2, and LPT3.

To operate with a Mic-button radio, set the radio to the initial frequency before starting Tracking/Tuning. The initial frequency is the one you configured in the □itune.cfg□ file for this radio. Also, be sure to set the step size on the radio to match the step size you selected, 100Hz is the default size. When you start Tracking/Tuning, the radio will start step tuning to set the proper up link or down link frequency. You can "fine-tune" using the radio's tuning dial if needed.

CONFIGURATION
InstantTune is very flexible and allows you to specify as many different radio setups and as many satellites and transponders as you want. It uses the file "itune.cfg" to tell it about the satellite transponders and about your radio setup. This file is a human-readable, plain old, ASCII text file. You can use whatever text editor you prefer to view or modify it including the DOS □edit□ and Windows □notepad□ editors.

As supplied, this file includes information about all satellite transponders that were available when the software was released. As new satellites are launched, you will want to add the transponder information so that you can operate with these new satellites.

Similarly, the supplied □itune.cfg□ file specifies a Yaesu FT-847 on COM 1 at 4800 BPS for all satellites. If you just want to change the COM port, you do not need to read this section of the manual. Instead, look at the comments in the □itune.cfg□ file. The instructions for changing the COM port are in there. Comments are indicated by a semicolon. Everything on a line after a semicolon is ignored.

It may be helpful to review the supplied □itune.cfg□ file before reading the rest of this section. The basic structure of this file consists of an optional COM port configuration section followed by a default radio configuration section followed by the satellite transponder section. You may over-ride the default radio configuration for each transponder.

After you have finished editing the □itune.cfg□ file, you can check your work by typing:

```
itune verify
```

at the DOS command prompt. This checks the □itune.cfg□ file for proper command syntax.
COM Port Configuration
If you use your radio at its factory default bit rate and on COM ports 1 or 2, you do not need to specify a COM port configuration.

To use COM ports 5 through 12, or if you have changed the default IRQs or I/O Addresses for COM ports 1

to 4, you must specify the COM port configuration so that InstantTune can use them.

Due to the nature of the PC architecture, there are some constraints when using COM ports 3 or 4. By default, IRQ 4 is used for COM ports 1 and 3 and IRQ 3 is used for COM ports 2 and 4. However, the PC architecture does not allow IRQ sharing. This means that you cannot use COM 1 and 3 or COM 2 and 4 at the same time. If you can change the COM 3 or 4 port configuration in your PC to use unique IRQs, you can avoid problems with using these COM ports. The LPT2 IRQ is often available for such re-assignment. Otherwise, you will need to select your radio configuration carefully so that you do not use COM 1 and 3 or COM 2 and 4, at the same time. This includes using them for a mouse, TNC, or modem.

For example, if you have HF, VHF, and UHF radios that each need a COM port, you could use COM 1 for HF, COM 2 for VHF, and COM 3 for UHF. That way you can use satellite transponder modes A, B, and J without IRQ conflicts. In this case, you do not need to specify the COM port configuration.

You can put several radios on the same COM port with an A/B switch as long as they are not all active at the same time. To specify a COM port configuration, use the following command:

comport PORT RATE IRQ ADDRESS

Where:
PORT = serial port number 1 to 12
RATE = bit rate; 300 to 19200 BPS is supported
IRQ = IRQ line 1 to 15
ADDRESS = base address of serial port in hexadecimal

To use the default value, set the parameter to 0 (zero.) When you select the default ADDRESS or IRQ, InstantTune reads your PC□s BIOS to find the values. This will generally work for COM ports 1 to 4 but it will not work on COM ports 5 to 12. The default bit rate is the factory default for the currently active radio. This 4800 BPS for Kenwood and Yaesu radios and 1200bps for ICOM radios.

EXAMPLES:
3. Change COM 3 to use IRQ 7, no other changes

comport 3 0 7 0

2. Add COM 12 using IRQ 15, at address 7fe, default bit rate

comport 12 0 15 7fe

3. Change COM 1 to use 9600 BPS instead of radio default rate

comport 1 9600 0 0

Configuring Radios
InstantTune is very flexible and allows you to specify everything from a single radio for all satellites, to unique radios for each transponder of each satellite.

The command syntax to specify a radio is as follows:

COMMAND RADIO PORT {SPECIAL PARAMETERS}

The COMMAND values are:

COMMAND

The RADIO types and SPECIAL PARAMETERS are:

Manufacturer
Notes:

For mic-button radios, the INITIALFREQ parameter is the frequency that you will set the radio to before starting radio tuning in MHz. For analog transponders, a frequency that is just below the pass-band is a good choice. For digital satellites, the nominal uplink/downlink frequency is a good choice.

For mic-button radios, the STEPSIZE is the frequency step of the UP/DOWN buttons in Hz. The minimum step size is 1 Hz. The tuning rate is 9 steps per second. A good compromise between speed and precision is 100 Hz step size. If you do not specify this parameter, the default is 100 Hz.

For the Kenwood TS-790, the transmitter frequency step size, TRANSMITTER_STEPSIZE, is adjustable in 20 Hz steps from 20 Hz to 100 Hz. If you do not specify this parameter, the default is 100 Hz.

The PORT parameter is the COM or LPT port number. InstantTune accepts COM ports 1 to 12 and LPT ports 1 to 3.

EXAMPLE 1:
Kenwood TS-450 on COM 1 used a receiver

```
rx kenwood 1
```

EXAMPLE 2:
Yaesu FT-847 on COM 2 used as a transceiver

```
xcvr ft847 2
```

EXAMPLE 3:
Mic-button radio on LPT 2 used as a transmitter, initial frequency 145.825 MHz, 100 Hz step size

```
tx micbutton 2 145.825 100
```

Configuring Frequency Converters
You can add frequency converters by using the following commands:

```
rxconverter  TRANSLATION ; receive converter
rxconverter2 TRANSLATION ; receive converter for auxiliary rx
txconverter  TRANSLATION ; transmit converter
```

The frequency TRANSLATION parameter is calculated by subtracting the antenna frequency from the radio frequency in MHz. Note that receive up-converters and transmit down-converters will have negative TRANSLATION parameters.

EXAMPLES:
1. Add a 437 to 28 MHz receive down converter

```
rxconverter 409.0
```

2. Add a 144 MHz to 1296 MHz transmit up converter

```
txconverter 1152
```

Setting a Default Radio Configuration
To specify a default radio configuration for all satellite transponders, use the above commands before any satellite transponders in the □itune.cfg□ file.

To over-ride the default for a specific transponder, use the above commands directly after the desired transponder configuration in the □itune.cfg□ file.
Configuring a Satellite Transponder
To configure a satellite transponder, you need to provide the name of the satellite, the name of the transponder mode, and the specifications for the transponder.

The name of the satellite must match EXACTLY the name in the InstantTrack satellite database. InstantTune uses the InstantTrack name to find the transponder specification. Thus if the InstantTrack database has a satellite named □RS-12/13□ in it, you cannot use □RS-12,□ you must use □RS-12/13.□ However, InstantTune will ignore the capitalization so the □rs-12/13□ will match □RS-12/13.□ This allows you to use both NASA and AMSAT format Keplerian elements. As with InstantTrack, satellite names may be up to 20 characters long.

The name of the transponder mode can be any character string up to five characters long. You can use the traditional mode names like □A, B, J, KA, or K/T□ or the new mode names created for P3D, such as □V/U□

and □L/S.□ InstantTune uses the mode name to uniquely identify the transponder; it does not make any assumptions about the transponder frequencies based on the mode name.

InstantTune supports linear transponders such as that found on AO-10 as well as fixed frequency transponders such as those on AO-27 or KO-25. When configuring linear transponders, be aware that some radios will not accept computer commands to set the transmitter out-of-band. This is especially and issue with European versions of radios. When you select a beacon frequency, if the corresponding transmit frequency is out of band, the radio may not initialize correctly. In this case, you will have to select a frequency for the beacon that is in the pass-band rather than the actual satellite beacon frequency.

InstantTune can support a second auxiliary down link. This down link can be used for a fixed frequency such as a beacon or it can be another tracking linear transponder. An example of a tracking linear transponder is RS-12/13 in mode KT. This mode has a 21 MHz up link with a 28 MHz down link and a simultaneous, tracking, 144 MHz down link.

To specify a new satellite transponder name and mode, the following command is used:

satellite NAME MODE

The keyword □satellite□ must be lower-case. The satellite NAME can be up to 20 characters long and the MODE can be up to 5 characters long. If a satellite transponder has only 1 mode, you do not need to specify a MODE.

This is followed immediately in the file by the transponder parameters. To specify the transponder parameters, the following commands are used:

transponder TRANSLATION ; linear transponder
transponder2 TRANSLATION ; tracking auxiliary linear transponder
beacon FREQUENCY MODULATION ; beacon for linear transponder
downlink FREQUENCY MODULATION ; fixed down link
downlink2 FREQUENCY MODULATION ; auxiliary fixed down link
uplink FREQUENCY MODULATION ; fixed up link

Some examples will be helpful:

Linear Non-Inverting Transponder
To specify a linear transponder, use the transponder and beacon commands. For a non-inverting transponder, the transponder TRANSLATION parameter is the DIFFERENCE between the down link and the up link frequencies in megahertz. You can also specify the nominal beacon frequency and modulation mode (am, fm, usb, lsb, cw, fsk.)
The default mode is cw.

Example: RS-12/13 mode A

satellite RS-12/13 A
transponder 116.502
beacon 29.4081 cw

Linear Inverting Transponder
To specify a linear transponder, use the transponder and beacon commands. For inverting transponders, the transponder TRANSLATION parameter is the SUM of the down link and the up link frequencies in megahertz followed by the key word □invert.□ You can also specify the nominal beacon frequency and modulation mode (am, fm, usb, lsb, cw, fsk.) The default mode is cw.

Example: AO-10 mode B

satellite AO-10 B
transponder 581.004 invert
beacon 145.81 cw

Fixed frequency Transponder
Fixed frequency transponders have fixed up and down link frequencies. All digital satellites are of this type. To specify a fixed frequency transponder, use the uplink and downlink commands. After the command word,

specify the frequency and modulation mode (am, fm, usb, lsb, cw, fsk) of each link.

Example: AO-27, FM repeater

satellite AO-27
downlink 436.80 fm
uplink 145.85 fm

Example: PACSAT AO-16, fm uplink, usb downlink

satellite AO-16
downlink 437.0513 usb
uplink 145.9 fm

Auxiliary Tracking Linear Transponder
An auxiliary, tracking, linear transponder provides a second down link that tracks the primary down link. This type of auxiliary link can only be used if the primary transponder is a linear type. You use the tuning knob on the main receiver to control the primary down link. The corresponding frequency and mode of the second receiver will be set for you by InstantTune. To specify an auxiliary tracking linear transponder, use the transponder2 command. The TRANSLATION parameter is calculated in the same manner as for the transponder command.

Example: RS-12/13 mode K/T

satellite RS-12/13 KT
transponder □8.2008   ; main transponder, 10 meter down link
transponder2 □124.706 ; auxiliary transponder, 2 meter down link
beacon 29.4081 cw

Auxiliary Fixed Transponder
An auxiliary fixed transponder provides a second down link with a fixed frequency and mode. You can use an auxiliary fixed transponder with either a linear or fixed main transponder. This allows you to use a second receiver to monitor a satellite beacon while simultaneously using the main transponder. To specify an auxiliary fixed transponder, use the downlink2 command followed by the nominal frequency and mode (am, fm, usb, lsb, cw, fsk.) The default mode is cw.

Example: RS-12/13 mode K plus cw robot downlink

satellite RS-12/13 K
transponder □8.2008
beacon 29.4081
downlink2 29.454 cw

COMMAND LINE CONTROL PROGRAM
The command line program □itune.exe□ allows you to control certain aspects of the InstantTune driver. The included □itstart.bat□ batch file uses it to load the driver. You can use this program if you want to change the default satellite transponder or to verify your □itune.cfg□ file after you have edited it. The other commands are provided for debugging and experimentation.

You execute commands one at a time by typing at the DOS prompt:

    itune COMMAND PARAMETERS <ENTER>

The COMMANDs are as follows:

COMMAND

PARAMETER DEFINITIONS:

    MODE   = Satellite transponder mode in "itune.cfg"
    SATELLITE   = Satellite Name in "itune.cfg"
    VELOCITY   = Satellite velocity divided by the speed of light

You can get the list of all commands and parameters by typing "itune" with no parameters at the DOS prompt. You can abbreviate commands by typing only the first letter instead of the complete word.

TROUBLESHOOTING

InstantTune TSR Will Not Load

InstantTune uses INT64 by default for its radio driver interface. If another program or driver is using INT64, the □itune.exe□ control program will print an error message and InstantTune will refuse to load. If possible, change the other program or driver to use a different interrupt. Otherwise you will have to use a different interrupt for InstantTune.

To change interrupts, set the environment variable "itrad" to the desired interrupt in hexadecimal. For example, to set the interrupt to INT62 use DOS command line:

```
set itrad=62 <ENTER>
```

Do this before loading InstantTune. You can edit the "itstart.bat" file to do this automatically. The instructions are in the "itstart.bat" file.

If you change the InstantTune command interrupt, you must also change the OrbitDRV configuration to use this interrupt for radio tuning. See the OrbitDRV documentation for details.

InstantTune looks for OrbitDRV at INT63 and hooks this interrupt to automatically turn on radio tuning when tracking is enabled. If you use a different interrupt for OrbitDRV, you must set the environment variable "itorb" to the desired interrupt in hexadecimal. For example to set the OrbitDRV interrupt to INT61, use DOS command line:

```
set itorb=61 <ENTER>
```

Do this before loading InstantTune. You can edit the "itstart.bat" file to do this automatically. The instructions are in the "itstart.bat" file.

Note that InstantTrack will not work with any OrbitDRV interrupt other than INT63. If you cannot use INT63, you will only be able to use the ITRACK command line program. See the documentation for OrbitDRV for details.

You can prevent InstantTune from hooking the OrbitDRV interrupt and prevent automatic tuning control from InstantTrack by setting the "itorb" environment variable to 0. This can be useful for experimenting or debugging.

No Radio Tuning

Check the TSR status, selection 9, from the InstantTrack main menu. If it shows tuning disabled, it means that InstantTune could not communicate with your radio.

- Verify your □itune.cfg□ file.
- Check the RS232 cable and connection. This is by far the most common source of problems.
- Check to see that the COM port specified in the "itune.cfg" file matches your actual radio setup.
- Make sure you do not type □itstart□ more than once per DOS session. If you type itstart more than once, you will end up with multiple copies of OrbitDRV and RotorDRV TSR□s. This will not work. To restart InstantTrack from the same DOS session, just type □it.□
- Check your "itune.cfg" file, you may have entered the wrong radio type or transponder information. Note that the "itune verify" command only checks for syntax errors, it will not detect an incorrect configuration.
- Check the operational notes for your radio to see if there is anything special that you need to consider.
- If using European versions of radios, be aware that you cannot start-up with the transmitter out-of-band. This is an issue on FO-20/29 satellites since when the receiver is set to the beacon, the transmitter frequency will be out-of-band. You may need to pick a beacon frequency that is actually in the pass-band rather than the actual satellite beacon.

Acknowledgements

The author regrets not remembering all the names of those who have provided support for this project over the past 8 years and apologizes to those he has left out here. If you have been forgotten, please send an email so you can be acknowledged in future releases. In particular, a fellow from HP provided significant help with the first version of the user manual but I am not sure I got him on the list. The author would like to thank the following people for their help and support:

Nick Adiletto, K1UXB #Danie Brynard, ZS6AWK
George Burr, VE3BCG
George Caswell, W1ME
Bdale Garbee, KB0G
Ann Hagerman
Robin Haighton, VE3FRH
Mark Hammond, KC4EBR
Charles Heisler, K3VDB
Mike Krueger, N6MIK - Yaesu Technical Support
Dave Lamont, ZL2AMD
Howard Long, G6LVB - author of TS-2000 and FT-817 drivers
Pat McGrath, KA6TYA
Mary Lou Monteiro
Michael Owen, W9IP
Ferruccio Paglia, IW1AM
Mike Rudzki, N8MR
Alfred Tribble, W3STW
Kelley Shaddrick, N0CZH
Arnold Shepperson, VK6VV #Steve Sherer, KE4LJH
Roger Snyder, K4RS
Huberto Willems ON1CAU #Paul Williamson, KB5MU
Brian Wruble, W3BW

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